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ABSTRACT

County-level data were gathered on California's agricultural-social conditions and the University of California's Cooperative Extension specializations, budgets, and manpower to measure the empirical relationship existing between the two. The agricultural and social data were treated as independent variables, while the Cooperative Extension information constituted the dependent variables. It was hypothesized that there is a positive relationship between the various Extension inputs and the agricultural and social needs at the county level. Three agricultural-social factors derived from an unpublished paper by D. MacCannell were employed to obtain correlations; these factors were: modern rational agriculture; rural isolation and poverty; and traditional family farming. Using the PA2 option of the SPSS computer statistical package with varimax rotation, zero-order correlations, means, and standard deviations of the Cooperative Extension dependent variables were obtained. Results indicated that Cooperative Extension specializations, budgets, and manpower correlated quite positively with the modern rational agriculture factor; showed almost no correlation with the traditional family farm factor; and had a strong negative correlation with the rural isolation and poverty factor. It was concluded there are sectors of California society which can be better served by this institution. (JC)

EVALUATION OF COOPERATIVE EXTENSION EFFORTS AT THE COUNTY LEVEL: THE UNIVERSITY OF CALIFORNIA EXAMPLE[1]

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I. Introduction

The University of California, as one of the Land Grant institutions established by the Morrill Act of 1862, has traditionally been responsible for support and maintenance of the State's agricultural sector. The University has received Federal assistance towards this end through the Hatch Act of 1887 [2] and the Smith-Lever Act of 1914. [3]

This paper examines the University of California's county-level extension component; specifically focusing on Cooperative Extension specializations, budgets, and manpower and their "fit" with the social and agricultural conditions of the counties within which they are located.

II. Background

The University of California's Cooperative Extension efforts grew out of the "Farmers' Institute" activities conducted by its College of Agriculture during the 1890's and early 1900's. These Institutes broadened the format of agricultural research dissemination from one stressing written reports (taking the form of Agricultural Experiment Station bulletins and articles submitted to scientific journals and agricultural periodicals) to one which allowed for direct communication between the agricultural researchers and the farmers themselves. This contact took the form of lectures and question-and-answer sessions held in agricultural communities throughout the State. [4]

The weakness of the "Farmers' Institute" idea was that it did not go far enough: there was no accompanying field demonstration of this information that would allow the farmers to see its actual value. The University at that time did not have the budget nor the manpower to undertake this aspect of dissemination until one of the California county governments allocated money to the University in 1913 to provide for someone to work year-around on local agricultural problems using demonstrational and organizational techniques. [5]

This initial thrust was augmented the following year with passage in the United States Congress of the Smith-Lever Act which established State Agricultural Extension Services to give "instruction and practical demonstrations in agricultural and home economics and subjects relating thereto to persons not attending or resident in said colleges in the several communities, and imparting information on said subjects through demonstrations, publications, and otherwise." [6]

Over the next sixty-two years these local-level efforts would expand from one county agent (advisor) who handled any and all agricultural and community-related problems to scores of Extension Specialists responsible for specific areas of county agricultural and social concerns.

III. Methodology

County-level data was gathered on both the agricultural and social conditions and the University of California's Cooperative Extension specializations, budgets, and manpower to measure the empirical relationship that exists between the two. The agricultural and social data are treated as independent variables (x), while the Cooperative Extension information are the dependent variables (y).

It is hypothesized that there is a positive relationship between the various Cooperative Extension inputs (i.e. specializations, manpower and budgets) and the agricultural and social needs at the county level. That is to say, the local-level Cooperative Extension activities are addressing the agricultural and social concerns of California counties.

In support of this hypothesis is the fact that Cooperative Extension has been in continual operation in many California counties for over fifty years, and through this long association it has become intimately aware of local problems, resources and conditions. That the University of California's extension component has historically modified and expanded its areas of expertise to deal with changing circumstances is seen in the following table: [7]

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Insert Table 1 here

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The sources of data for the county-level agricultural and social information are: (a) the U.S. Bureau of the Census' Census of Agriculture, 1969; (b) the U.S. Bureau of the Census' County and City Data Book, 1972; and (c) the State of California's Population Research Unit Reports.

Cooperative Extension data comes from (a) the University of California's 1976 edition of the Cooperative Extension Personnel Directory, and (b) the Office of the Associate Director of Cooperative Extension.

It is noted that the agricultural and social data are taken from a period four to seven years prior to the Cooperative Extension data. This difference allows sufficient time for the former information to be assimilated into the Uni-

versity's Cooperative Extension programming and ultimately be reflected in current Cooperative Extension efforts in California counties.

IV. County-Level Agricultural and Social Data

In an unpublished paper by D. MacCannell, he uses census data to isolate three agricultural-social factors that characterize the counties of California.[8] Table 2 presents these factors and their respective variable loadings:

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Insert Table 2 here

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Each of these factors is briefly described below, along with some of the highest loading variables in each factor. MacCannell characterizes his factors as follows:

Factor 1: Modern Rational Agriculture

This factor is the strongest in California agriculture, explaining 56.5 per cent of the variance. A factor loading is a correlation between a variable and a factor. The variables loading most heavily onto Factor 1 are indicators of rational economic practices, scientific procedures, high production levels, and full utilization of agricultural land and labor. The specific variables and their factor loadings are listed below:

Variable	Loading
Number of farms irrigated in 1969	.94
Number of farms where hired workers worked less than 150 days in 1969	.93
Number of farms with expenses greater than $ 40,000 in 1969	.94
Number of farms where operators did not reside on the land	.91
Value of crops sold	.89
Value of agricultural products	.88
Farms receiving income (subsidies) from government payments	.69

Factor 2: Rural Isolation and Poverty

A second factor which is quite strong in California, explaining thirty-three per cent of the variance, suggests a set of social arrangements which are neither agricultural nor urban. Our research shows it to be characterized by poor families

and dwellings, scattered over the countryside, and not integrated with existing communities or the agricultural economy. This is clearly the rural isolation and poverty factor as seen below:

Variable	Loading
Per cent of families with income less than $ 3,000 per year	.69
Per cent of families with income above $ 25,000 per year	-.72
Per cent of housing built prior to 1950	.56
Per cent of housing with substandard plumbing	.65
Per cent of homes with food freezer	.77
Per cent of homes with telephone available	-.82
Median family farm income	-.51
Per cent of the population considered urban	-.85
Per cent of towns with populations under 10,000	.85
Per cent of the population considered rural non-farm	.82
Per cent of the labor force employed	.49

Factor 3: Traditional Family Farming

This third factor is not strong statistically in contemporary California, accounting for only ten per cent of the variance. Nonetheless, it is important in other ways: it is the shrinking empirical basis for our most widely-held stereotype of rural America.

The factor is comprised of a complex of mainly family farms, where the owner-operators, using older equipment, eke out a decent, but by no means extravagant, life by hard work, years of experience, and a certain amount of skepticism over new techniques:

Variable	Loading
Per cent of total county acreage devoted to family farms	.61
Per cent of population over 65 years of age	.54
Per cent of farms with sales less than $ 10,000 per year	-.70
Per cent of farm tractors built after 1964	-.59
Per cent of total county acreage devoted to corporate farms	-.51
Median family farm income	.43

Factor scores were obtained using the PA2 option of the SPSS computer statistical package with varimax rotation. Table 3 shows the zero-order correlations, means, and standard deviations of the Cooperative Extension dependent variables:

Insert Table 3 here

The factor scores derived from the twenty-four variables listed in Table 2 are treated as the independent (predictive) variables in the multiple regression analysis discussed later in the paper.

V. County-Level Cooperative Extension Data

Specializations

Data obtained from the University of California's 1976 Cooperative Extension Personnel Directory reflects that institution's county-level specialization mix, and seems to group into three distinct types: Extension specialists concerned with general agricultural subjects such as livestock, range, vegetables, soils, irrigation, etc; specialists involved with specific agricultural commodities or areas such as dairy, grapes, cotton, etc; and specialists involved in social activities such as 4-H, family and consumer sciences, nutrition, home economics, public service, etc.[9]

Guttman Scales for each of these three specialization types were attempted with limited success. The social program specialization type yields the following scale:

Insert Table 4 here

County-level specializations in both the general agriculture and the specific commodity-area types do not result in good Guttman Scales. This is perhaps due to the fact that California is a highly differentiated state both geographically and agriculturally, and it is impossible to characterize it in terms of a single basic agricultural complex as one might characterize the dairying areas of Wisconsin, the corn and hog farms of Iowa, or the range cattle complex of the Southwest.[10] Whereas some California counties have a diversified agricultural crop mix others are very specialized with only one or two major crops. Since scale scores cannot be obtained for the two Cooperative Extension specialization types mentioned above, their respective index scores are used instead.[11]

Manpower and Budgets

Dependent variable data in addition to the specialization information discussed above are also obtained on budgetary and manpower support for county-level Cooperative Extension activities from various levels of government. This data reflects support (a) from the county, (b) from the University of California, and (c) from the Federal government.[12]

The relationship between agricultural and social conditions (the independent variables) and Cooperative Extension specializations, budgets and manpower (the dependent variables) at the county-level is now examined using SPSS multiple regression program techniques.

VI. The Results

Table 5 shows the relationship between the independent and dependent variables:

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Insert Table 5 here

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It is clearly seen through examination of the Beta scores[13] and the adjusted R^2 figures[14] that Cooperative Extension specializations, budgets, and manpower correlate quite positively with the Modern Rational Agriculture factor; they show almost no correlation with the Traditional Family Farm factor; and they have a strong negative correlation with the Rural Isolation and Poverty factor. It is not too surprising that, given the trend in California agriculture towards larger and larger operations, Cooperative Extension activities at the county-level relate quite positively to the first factor. Cooperative Extension's negligible or negative relationship with the other two factors indicates that, at the very least, there are other sectors of California society which can be better served by this Institution.

VII. Implications

The three factors previously discussed indicate that the agricultural and social conditions of California counties require a varied approach by Cooperative Extension administrators and county-level personnel. Thus far such an approach has not taken into account the varied nature of the agricultural and rural sec-

tors. A positive step in this direction would be the administrative analysis of current Cooperative Extension programs and recipients, funding priorities, ethnic composition of county-level personnel, and the availability of Cooperative Extension Specialists in non- "modern rational agriculture" areas.

Private [15] and public [16] sectors of California society are increasingly calling for expansion or initiation of Cooperative Extension efforts into such currently non-recognized areas as small family farming, organic farming, and rural services.

This analysis of local-level agricultural and social conditions indicates that such Cooperative Extension involvement is warranted.

TABLE 1

Growth of Cooperative Extension Subject Matter Expertise in California

YEARS	SUBJECT MATTER EXPERTISE
1913-1920	4-H, Home Economics, Dairying, Clothing, Home Furnishings, Poultry
1921-1940	Visual Aids, Information, Farm Management, Nutrition, Agricultural Engineering, Irrigation, Drainage, Pomology, Subtropical Horticulture
1941-1950	Marketing and Outlook, Agronomy, Animal Husbandry, Forestry, Veterinary Science, Home Management, Plant Pathology, Soils, Water; Vegetable Crops
1951-1960	Range Management, Viticulture, Weed Control, Ornamental Horticulture, Family Relations, Cotton, Entomology
1961-1970	Radio, TV, Consumer Marketing, Agricultural Climatology, Apiculture, Enology, Floriculture, Food Technology, Nematology, Parasitology, Wildland Use, Wildlife Management, Public Affairs, Community Resource Development
1971-1976	Consumer Economics, ENEP (Expanded Nutrition and Education Program); EFNEP (Expanded Food and Nutrition Education Program), Environmental Studies, Pesticide Research, Migrant Education, Marine Resource Advisers

Table 2. Principal Factor Analysis (Varimax Rotation) of Measures of California's Agricultural and Rural Sectors

	Modern Rational Agriculture	Rural Isolation & Poverty	Traditional Family Farming
1. Number of Farms irrigated in 1969	.94	- .05	- .05
2. Number of Farms with hired workers working less than 150 days per year	.93	- .05	- .11
3. Number of Farms with expenses greater than $ 40,000 per year	.94	- .16	- .19
4. Number of Farms having non-resident operators	.91	- .23	- .08
5. Value of crops sold, 1969	.89	- .11	- .34
6. Value of agricultural products, 1969	.88	- .11	- .33
7. Income from custom work	.94	.06	- .25
8. Income from government payments (subsidies)	.69	.13	- .37
9. Median family farm income	- .14	- .51	.43
10. Per cent of the Population considered rural non-farm	- .30	.82	.32
11. Per cent of the Population that is urban	.26	- .85	- .31
12. Per cent of families with income less than $ 3,000 per year	.29	.69	.19
13. Per cent of families with income greater than $ 25,000 per year	- .12	- .72	- .13
14. Per cent of towns with populations under 10,000	- .03	.85	.10
15. Per cent of housing that was built prior to 1950	- .01	.56	- .03
16. Per cent of housing with sub-standard plumbing	- .14	.65	.02
17. Per cent of homes with food freezer	- .25	.77	.20
18. Per cent of homes with telephone available	.08	- .82	.16
19. Per cent of the labor force employed	- .09	.49	.25
20. Per cent of total acreage devoted to family farming, 1969	- .29	.36	.61
21. Per cent of total acreage devoted to corporate farming, 1969	.13	- .17	- .51
22. Per cent of the Population over 65 years of age	- .06	.40	.54
23. Per cent of farms with sales less than $ 10,000 per year	- .28	- .08	.70
24. Per cent of farms having tractors built during or after 1965	.25	- .08	- .59
Percent of the variance explained	56.5	33.2	10.3

NOTE: This is the principal factor analysis which derives from the common factor model. It utilizes the PA2 option of the SPSS computer statistical package.

SOURCES:
- Variables 1-8, Census of Agriculture, 1969
- 9-13 County & City Data Book, 1972
- 14 State of California, California City & Unincorporated Place Names July 1, 1973
- 15-19 County & City Data Book, 1972
- 20-21 Census of Agriculture, 1969
- 22 County & City Data Book, 1972
- 23-24 Census of Agriculture, 1969

Table 3. Zero-Order correlations, means, and standard deviations for dependent variables: Cooperative Extension support level for California Counties

Variables	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8	Y_9	Y_{10}	Y_{11}	Y_{12}	$\bar{Y}$	S.D.
Social Program Scale Score (Y_1)	1.	.39	.62	.60	.59	.56	.55	.54	.47	.61	.46	.59	3.66	1.59
Crop Diversity Index Score (Y_2)		1.	.72	.68	.72	.72	.46	.50	.51	.48	.38	.47	3.79	2.93
Total County Budget 1976-77 (Y_3)			1.	.94	.97	.88	.62	.72	.73	.68	.62	.69	80815.91	64740.98
F.T.E. Budgeted by County 1976-77 (Y_4)				1.	.98	.84	.51	.62	.60	.62	.59	.64	4.29	3.34
Employee Salaries by County 1976-77 (Y_5)					1.	.85	.55	.68	.66	.65	.61	.67	44177.48	37134.89
Total University Budget less EFNEP (Y_6)						1.	.55	.67	.67	.63	.49	.63	126597.32	89092.81
Total EFNEP Budget 1976-77 (Y_7)							1.	.91	.90	.89	.75	.87	6853.57	12768.66
EFNEP Adult Home Advisor F.T.E. (Y_8)								1.	.97	.95	.78	.93	.18	.32
EFNEP Adult Home Advisor Salaries (Y_9)									1.	.90	.71	.86	3808.93	6865.28
Total ENEP Adult Budget 1976-77 (Y_{10})										1.	.80	.97	30639.00	54432.95
Total ENEP Youth Budget 1976-77 (Y_{11})											1.	.89	10688.39	21979.85
Total ENEP Budget for County 1976-77 (Y_{12})												1.	41327.39	73207.64

Note: All correlations are significant at the .05 level.

TABLE 4: GUTTMAN
SCALE OF DIFFERENTIATION OF SOCIAL PROGRAMS
BY COOPERATIVE EXTENSION PERSONNEL
IN 58 CALIFORNIA COUNTIES

STEP NUMBER	CONTENT	PROPORTION OF SAMPLE DISCRIMINATED	NUMBER OF ERRORS BY ITEM *
1	County Director	.98	0
	-4H Youth Advisor	.98	0
2	Family & Consumer Sciences	.67	4
3	Home Economist/ Home Advisor	.47	7
4	Public Service	.26	6
5	Expanded Nutrition & Education Program (ENEP)	.17	4
6	Public Affairs	.10	4
7	Public Policy	.07	3

Coefficient of Scalability * = .663

* Using the Goodenough technique

SOURCE: Cooperative Extension Personnel Directory, 1976.
University of California Special Publication 3055
February 1976

Table 5: Multiple Regression Analysis Relating Agricultural and Social Conditions to Level of Cooperative Extension Support: 56 California Counties

Independent Variables	Dependent Variables**											
	Social Program Scale Score		Crop Diversity Index Score		Total County Budget		# F.T.E. Budgeted by County		Employee Salaries by County		Total University Budget less EFNEP	
	b[1]	Beta	b	Beta	b	Beta	b	Beta	b	Beta	b	Beta
Factor 1: Modern Rational Agriculture	.62	.39*	1.58	.54*	44363.96	.68*	1.96	.58*	24044.11	.64*	72503.44	.81*
Factor 2: Rural Isolation & Poverty	-.92	-.57*	-1.43	-.48*	-32199.16	-.49*	-1.71	-.51*	-18524.74	-.49*	-31719.42	-.35*
Factor 3: Traditional Family Farming	.06	.03	-.34	-.11	-6120.59	-.09	-.44	-.12	-3519.12	-.09	-12000.81	.12*
Regression Constant	3.67		3.81		81448.54		4.32		44528.73		127460.24	
R^2 Adjusted	.46		.53		.72		.62		.67		.81	

** All equations in this Table are significant at the .05 level

* b is significant at the .05 level

[1] b is the unstandardized regression coefficient; Beta is the standardized regression coefficient

Independent Variables	Dependent Variables											
	Total EFNEP Budget		# EFNEP Adult Home Advisor F.T.E.		EFNEP Adult Home Advisor Salaries		Total ENEP Adult Budget		Total ENEP Youth Budget		Total ENEP Budget for County	
	b	Beta	b	Beta	b	Beta	b	Beta	b	Beta	b	Beta
Factor 1: Modern Rational Agriculture	4842.48	.38 *	.16	.51 *	3592.85	.52 *	24594.58	.45 *	5286.20	.24 *	31347.43	.43 *
Factor 2: Rural Isolation & Poverty	-6921.14	-.54 *	-.16	-.50 *	-3306.94	-.48 *	-30004.03	-.55 *	-10869.89	-.49 *	-38223.52	-.52 *
Factor 3: Traditional Family Farming	679.63	.05	.05	.14	918.76	.12	7708.94	.13	573.95	.02	8590.85	.11
Regression Constant	6951.84		.18		3867.67		31102.29		10822.14		41916.11	
R^2 Adjusted	.41		.50		.49		.50		.27		.44	

APPENDIX TABLE 1

COOPERATIVE EXTENSION SPECIALIZATIONS

SOCIAL PROGRAM SPECIALIZATIONS	GENERAL AG. SPECIALIZATIONS	CROP DIVERSITY SPECIALIZATIONS
County Director	Farm Advisor	Turf/Turfgrass
Community Resource Development	Vegetables/Veg Crops	Poultry
4-H Youth Advisor	Field Crops	Floriculture
Public Service	Horticulture Advisor	Viticulture/Vines/ Wine Grape
Home Economist/ Home Advisor	Environmental Horticulture	Beef
Family & Consumer Sciences	Woody Ornamentals/ Ornamental Horticulture	Citrus
ENEP - Adult	Soils	Almonds
4-H Youth Staff Assistant	Water/Water Quality	Walnuts
ENEP - Youth Adult Staff Assistant	Livestock	Prunes
Public Affairs	Range/Range Improvement	Peaches
Special Programs/ Special Proj.	Feed Crops/Crops	Rice
ENEP	Fruit Crops/Deciduous Fruits	Sugar Beets
Field Assistants/SRA's	Pasture & Range	Dairy
Resources & Environment	Wildlife	Winter Cereals/ Winter Grains
Pesticide Research Studies	General Agriculture	Christmas Trees
4-H Youth Program Leader	Fruit & Nuts	Grapes
4-H Livestock Leader Training	Row Crops	Cotton
Migrant Education Program	Seed Crops/Seed Production	Forestry/Forest Advisor
Public Policy	Irrigation	Alfalfa
	Drainage	Nurseries
	Weeds/Weed Control	Avocado
	Forage Crops/Forage	Strawberries
	Entomology	Area Marine Advisor
	Plant Pathology/ Pathology	
	Feed Lots	
	Agronomy	
	Waste Management	
	Landscape Horticulture	

FOOTNOTES

1. The author wishes to acknowledge the support given him by Professor Dean MacCannell. This paper is drawn from a portion of the data compiled in the course of his California Agricultural Experiment Station project entitled "Macro-Social Accounting System for California."
2. Which provided for the direct payment of federal funds to states that established agricultural (research) experiment stations.
3. Which established the state agricultural extension services throughout the country.
4. Clarke, "Farmers Institutes and University Extension in Agriculture," pp. 1-4.
5. Hunt, Report of the College of Agriculture and the Agricultural Experiment Station of the University of California From July 1, 1912 to June 30, 1913, pg. XL.
6. United States Statutes at Large, XXXVIII, part II, pp. 372-374 (Smith-Lever Act of May 14, 1914).
7. Teague, "Outline of Cooperative Extension in California," pg. 3.
8. For a fuller discussion of these factors see MacCannell's "Variations in California Agriculture" paper.
9. Appendix Table I gives the complete listing of all Cooperative Extension specializations included under each of the three specialization types.
10. MacCannell, "Variations in California Agriculture," pg. 1.
11. Index scores refer to the total number of specializations each county has in each of the specialization types mentioned above. These specializations are added up to give each county's index score for each type.

12. Federal support is measured in terms of the Government's EFNEP (Expanded Food and Nutrition Education Program) program activities in various California counties.
13. The standardized regression coefficients which show the proportion of over-all variance accounted for by one variable, when all the other variables in the equation are held constant.
14. The over-all per cent of the variation in the dependent variable explained by the independent variables operating jointly.
15. Fujimoto, "The People and the University: A Conference to Initiate the Redirection of Priorities for University Research."
16. California State Assembly Subcommittee on Post-Secondary Education, "Study Plan: University of California Cooperative Extension."

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